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2823 AF

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Mostafazadeh et al.

Application No.: 10/044,162

Filed: January 11, 2002

Title: PLASTIC PACKAGE WITH EXPOSED DIE AND METHOD OF MAKING SAME

Attorney Docket No.: NSC1P225R/P03405D1-R1

Examiner: Pham, T.

Group: 2823

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as first-class mail on December 21, 2006 in an envelope addressed to the Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450.

Signed: Lara M. Nelson

Lara M. Nelson

APPEAL BRIEF TRANSMITTAL
(37 CFR 192)

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This brief is in furtherance of the Notice of Appeal filed in this case on September 27, 2006.

This application is on behalf of

☐ Small Entity ☒ Large Entity

Pursuant to 37 CFR 1.17(f), the fee for filing the Appeal Brief is:

☐ $250.00 (Small Entity) ☒ $500.00 (Large Entity)

☒ Applicant(s) hereby petition for a one-month extension(s) of time to under 37 CFR 1.136.

If an additional extension of time is required, please consider this a petition therefor.

☐ An extension for months has already been secured and the fee paid therefor of $ is deducted from the total fee due for the total months of extension now requested.

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02 FC:1251 120.00 OP

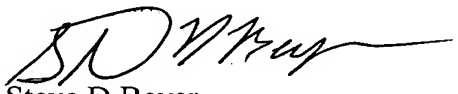
☒ Applicant(s) believe that no (additional) Extension of Time is required; however, if it is determined that such an extension is required, Applicant(s) hereby petition that such an extension be granted and authorize the Commissioner to charge the required fees for an Extension of Time under 37 CFR 1.136 to Deposit Account No. 500388.

Total Fee Due:	
Appeal Brief fee	$500.00
Extension Fee (if any)	$120.00
Total Fee Due	$620.00

☒ Enclosed is Check No. 32584 in the amount of $620.00.

☒ Charge any additional fees or credit any overpayment to Deposit Account No. 500388, (Order No. NSC1P225R). Two copies of this transmittal are enclosed.

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP



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DEC 26 2006
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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF APPEALS

EX PARTE MOSTAFAZADEH et. al.

Application for Patent

Filed January 11, 2002

Serial No. 10/044,162

FOR:

PLASTIC PACKAGE WITH EXPOSED DIE AND METHOD OF MAKING SAME

APPEAL BRIEF

12/27/2006 BABRAHA1 00000023 10044462
01 FC:1402 500.00 OP

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Signed: Lara M. Nelson
Lara M. Nelson

BEYER WEAVER, LLP
Attorneys for Applicant

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I. REAL PARTY IN INTEREST

The real party in interest is National Semiconductor Corp., the assignee of the present application.

II. RELATED APPEALS AND INTERFERENCES

The undersigned is not aware of any related appeals and/or interferences.

This application is a reissue of U.S. Patent No. 6,117,710 which is a Divisional of U.S. Patent No. 5,894,108. The '108 patent is also currently the subject of a reissue application (App. No. 11/244,409).

III. STATUS OF THE CLAIMS

Claims 1 and 4-15 are pending and subject to this appeal. Each of the pending claims stands rejected under 35 USC §103. Claims 11, 13, 18, 26 and 38 also stand rejected under 35 USC 112, first paragraph.

Claims 2-3 have been cancelled.

All of the pending claims stand rejected and are subject to this appeal.

IV. STATUS OF THE AMENDMENTS

This Appeal is taken from the Final Office Action dated June 29th, 2006. Applicants Filed a Response to the Final Office Action on July 12th, 2006. That Response to the Final Office Action did not contain any amendments. In an Advisory Action dated August 24th, 2006, the Examiner indicated that the Request for Reconsideration did not put the case in condition for allowance.

A Pre-Appeal Brief Request for Review was filed on September 27th, 2006. That request for review was the Second Pre-Appeal Brief Request for Review. An earlier Pre-Appeal Brief Request for Review was filed on March 31, 2006 and resulted in the withdrawal of an earlier final rejection.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The claimed inventions relate generally to **lead frame** based methods of packaging integrated circuits. More particularly, the **lead frame** and a die are mounted on an adhesive tape. (See, e.g. Fig. 5). After electrically connecting the die to the lead frame, a plastic casing is formed over the die and lead frame. (See, e.g., Fig. 6). The tape prevents the plastic casing (e.g. molding) material from flowing beneath the lead frame. After the casing has been formed, the tape may be removed. With this arrangement, the bottom surface of the lead frame (which was attached to the adhesive tape) remains exposed at the bottom surface of the package and the exposed leads form the electrical contacts (indeed the only electrical contacts) for the package.

A) Claim 1

Independent Claim 1 requires that the lead frame is flat (see, e.g., Col. 2, line 63) and has a plurality of radial leads extending from a central opening. (See, e.g., Col. 2, lines 64-66). The lead frame and an integrated circuit die are mounted onto a strip of adhesive tape such that lower surfaces of both the die and the lead frame contact the adhesive tape, and the die is positioned within the central opening in the lead frame. (See, e.g., Fig. 4 and Col. 3, line 55 - Col. 4, line 9). The die is electrically connected to the lead frame with the adhesive tape in place. (See, e.g., Fig. 5 and Col. 4 lns. 10-12.) A plastic casing is then formed over the die and the upper surface of the lead frame with the adhesive tape in place. With this arrangement, the plastic casing comes into contact with the adhesive tape in the gaps between leads and the gap between the leads and the die. Thus, the lower surface of the plastic casing is substantially co-planar with the lower surfaces of the lead frame and the die. (See, e.g., Fig. 6 and Col. 4, lns. 13-24). The adhesive tape is removed after forming the plastic casing. In the resulting package, the exposed surfaces of the lead frame directly form the only externally exposed and accessible I/O contacts for the package. (See, e.g., Fig. 7 and Col. 4, lns. 26-30).

B) Claim 7

Independent Claim 7 is somewhat similar to independent claim 1, although it is broader in some respects. As presented, claim 7 requires the use of a lead frame having a plurality of leads extending from a central opening. (See, e.g., Col. 2, lines 64-66). The lead frame and an integrated circuit die are mounted onto a strip of adhesive tape such that lower surfaces of both the die and the lead frame contact the adhesive tape, and the die is positioned within the central opening in the lead frame. (See, e.g., Fig. 4 and Col. 3, line 55 - Col. 4, line 9). The die is electrically connected to the

lead frame with the adhesive tape in place. (See, e.g., Fig. 5 and Col. 4 lns. 10-12.) A plastic casing is then formed over the die and the upper surface of the lead frame with the adhesive tape in place. With this arrangement, the plastic casing comes into contact with the adhesive tape in the gaps between leads and the gap between the leads and the die. Thus, the lower surface of the plastic casing is substantially co-planar with the lower surfaces of the lead frame and the die. (See, e.g., Fig. 6 and Col. 4, lns. 13-24). The adhesive tape is removed after forming the plastic casing. In the resulting package, the exposed surfaces of the lead frame directly form the only externally exposed and accessible I/O contacts for the package. (See, e.g., Fig. 7 and Col. 4, lns. 26-30).

C) Claim 15

Independent Claim 15 is somewhat narrower than claims 1 and 7. The primary differences of claim 15 are that it requires that the lead frame be cut so that the leads are substantially flush with the side surfaces of the casing and it requires the application of solder to the exposed lower surfaces of the leads. More specifically, as presented, independent claim 15 specifically requires the use of a lead frame having a plurality of leads extending from a central opening. (See, e.g., Col. 2, lines 64-66). The lead frame and an integrated circuit die are mounted onto a strip of adhesive tape such that lower surfaces of both the die and the lead frame contact the adhesive tape, and the die is positioned within the central opening in the lead frame. (See, e.g., Fig. 4 and Col. 3, line 55 - Col. 4, line 9). The die is electrically connected to the lead frame with the adhesive tape in place. (See, e.g., Fig. 5 and Col. 4 lns. 10-12.) A plastic casing is then formed over the die and the upper surface of the lead frame with the adhesive tape in place. With this arrangement, the plastic casing comes into contact with the adhesive tape in the gaps between leads and the gap between the leads and the die. Thus, the lower surface of the plastic casing is substantially co-planar with the lower surfaces of the lead frame and the die. (See, e.g., Fig. 6 and Col. 4, lns. 13-24). After the molding, the lead frame is cur so that the ends of the leads are substantially flush with the side surfaces of the casing. (See, e.g., Col. 4, lns. 32-37). The adhesive tape is removed after forming the plastic casing. In the resulting package, the exposed surfaces of the lead frame directly form the only externally exposed and accessible I/O contacts for the package. (See, e.g., Fig. 7 and Col. 4, lns. 26-30). Solder is then applied to the lower surfaces of the exposed leads. (See, e.g., Col. 4, lns. 32-37).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

All of the pending claims stand rejected under 35 USC 103(a) as being unpatentable over U.S. Patent No. 5,200,362 (Lin et al.) in combination with U.S. Patent No. 5,252,855 (Ogawa). The Applicant seeks to have these rejections reversed in the outstanding Appeal.

VII. ARGUMENT

A) The Present Invention

The present invention relates to **lead frame** based methods of packaging integrated circuits. More particularly, the **lead frame** and a die are mounted on an adhesive tape. (See, e.g. Fig. 5). After electrically connecting the die to the lead frame, a plastic casing is formed over the die and lead frame. (See, e.g., Fig. 6). The tape prevents the plastic casing (e.g. molding) material from flowing beneath the lead frame. After the casing has been formed, the tape may be removed. With this arrangement, the bottom surface of the lead frame (which was attached to the adhesive tape) remains exposed at the bottom surface of the package and the exposed leads form the electrical contacts (indeed the only electrical contacts) for the package.

B) Claims 1 and 4-15 - Lin does not disclose a lead frame

All of the claims in the present application are specifically directed at **lead frame** based methods of packaging integrated circuits. Although the exact wording of the claims vary somewhat, each independent claim specifically requires the step of: (1) "providing" or "forming" a lead frame; and (2) mounting the lead frame on an adhesive strip. In the outstanding final rejection, it is asserted that Lin discloses the step of "forming a flat lead frame 13 including ...". The assertion that Lin discloses the step of forming a **lead frame** is respectfully traversed.

The Lin reference contemplates the adhesion of a conductive **foil** or the deposition of a conductor material onto a flexible "transfer film". See the paragraph beginning on at Col. 2, line 33 of the Lin patent. It is respectfully submitted that the significant distinctions between the foil based technologies discussed by Lin and the lead frame technology of the present invention are widely understood to those skilled in the art and that such people would understand the term lead frame to exclude thin metal foils/sheets/deposited conductive layers, that are disclosed by Lin.

To support the assertion that Lin contemplates the use of lead frames, the advisory action dated August 24th, 2006 cites a portion of a sentence that occurs late in the paragraph referenced above (at Col. 2, lines 51 – 54) which reads:

> In yet another embodiment, a pattern of traces is formed from a thin sheet of metal and that pattern of traces is then laminated to the transfer film.

The advisory action takes the position that the thin sheet of metal is a lead frame. Although lead frames are formed from relatively thin sheets of metal (e.g., copper), they are not the thin sheets of metal that are discussed in the '362 patent. Indeed, Lin teaches away from the use of a lead frame. Specifically, at lines 56-57, Lin states that: "**No thick device "header" or leadframe is necessary for mounting the device die, and so the thickness 't' is minimized.**" *(t - the thickness of the package).*

Generally, lead frames are known to be **self-supporting sheet metal frameworks** that are used in semiconductor packaging. There is a large installed base of equipment suitable for handling lead frames and particularly, the lead frame strips or panels that individual lead frames are part of. More particularly, as is notoriously well known in the art, lead frames strips or panels generally have skirts, tie bars, rails and/or other structures that support the leads and rails or other structures that may be used by the handling equipment during fabrication and packaging. Such skirts and rails are trimmed away at some point in the packaging process (generally after the package has been molded in molded packages).

In contrast, as can be seen in Lin's Figs. 8 and 9, and as explained in the accompanying descriptions, in all of the embodiments shown in the Lin reference, the transfer film (element 12 of Fig. 8, element 50 of Fig. 9) is the component that is handled by handling equipment. This is an approach that is appropriate for use in foil based packaging and is a very different approach than that used in lead frames. Nothing suggests that the pattern of traces that is formed from the thin sheet of metal (as described at Col. 2, lines 51 – 54) is a "lead frame" as that the term is commonly understood in the art. That is, nothing suggests that the "pattern of traces" that are laminated to the transfer film is **a self-supporting structure that can be independently handled** in the pre-molded state as would be inherent in the claimed "lead frame" as that term is commonly understood in the art.

It is reiterated that lead frames are widely used within the semiconductor packaging industry. There is a large installed base of equipment suitable for handling lead frames. In contrast, foil or

taped based processes (which are also generally known within the industry) are generally significantly more expensive than lead frame based processes. Accordingly, it is not surprising that they are far less widely used than lead frame based packaging. The equipment used for handling tapes and foils during assembly is generally different than the equipment used for handling lead frames. Therefore, it should be appreciated that a very significant advantage of the present invention is that the described devices can be fabricated using an inexpensive technology (i.e., lead frames) that is quite familiar to many people in the art using much of their existing equipment. Given the significant differences between lead frame based packaging and the foil / thin film approach described by Lin, it is respectfully submitted that nothing in the Lin reference suggest the use of a **lead frame** on the described transfer film.

Since the outstanding rejection on the basis of Lin as the primary reference is based primarily on the incorrect assumption that Lin teaches the use of lead frames in their described process, it is respectful submitted that all of the outstanding rejections of claims 1 and 4-15 based on the combination of Lin and Ogawa must be reversed for at least that reason.

C) Claims 1 and 4-15 – A person of ordinary skill in the art would not be motivated to replace the thin film foil described by Lin with the lead frame of Ogawa

As acknowledged in the outstanding final rejection[1], the foil described by Lin does not include a central opening. Rather, as can best be seen if Figs. 2-7 and 8, Lin contemplates the provision of a trace 13 to which the die 15 can be attached. (Note, that in the illustrated embodiment, Lin does not differentiate between the traces used for electrical connection and the trace that underlies the die). The outstanding office action then takes the position that it would be obvious to provide the method of Lin with a led frame of Ogawa in order to form a thinner package. This assertion is respectfully traversed for a number of reasons.

1) <u>It would make no sense to attach a lead frame to the transfer film employed by Lin</u>

Initially, as pointed out above, Lin describes a foil on film based packaging approach. It is respectfully submitted that those of ordinary skill in the art would not be motivated to secure a lead frame to the transfer film 12 because, *inter alia*, the lead frame would interfere with the handling equipment used to handle the transfer film during the packaging process. Thus, it is respectfully submitted that the outstanding office action has not made a prima facie case of obviousness for at least this reason. Accordingly, it is respectfully submitted that the outstanding rejections of claims 1

[1] See, Page 3 of the Final Office Action Dated June 29th, 2006.

and 4-15 based on the combination of Lin and Ogawa must be reversed for at least this reason as well.

2) Lin Teaches Away from the use of a Lead Frame

In the description of Figure 5 (which shows the completed semiconductor device after the transfer film has been removed), Lin specifically teaches away from the use of a lead frame. Specifically, at lines 56-57, Lin states that: "**No thick device "header" or leadframe is necessary for mounting the device die, and so the thickness 't' is minimized.**" *(t - the thickness of the package).* It is respectfully submitted that this explanation clearly teaches away from the use of a lead frame in Lin's package. It also clearly indicates that Lin did not contemplate that the traces formed from a thin sheet of metal" that are described at Col. 2, lines 51-54 constitute a lead frame. Accordingly, it is respectfully submitted that those of ordinary skill in the art would not have been motivated to utilize the lead frame of Ogawa in the Lin package for at least this reason as well.

3) Those or ordinary skill in the art would not be motivated to substitute a lead frame (which is relatively thick) for the thin film conductive layer disclosed by Lin to provide a thinner package.

The outstanding rejection asserts that the motivation to combine would be based on the desire to form a thinner package. This assertion is also traversed. Initially, Lin contemplates forming very thin traces. By way of example, at Col. 4, lns 49-55, Lin describes forming the traces by evaporating a film of conductive material onto the surface of the transfer film and then electroplating the patterned seed to achieve the desired thickness. It is notoriously well known in the art that traces formed by electroplating are substantially and significantly thinner than leads (or other components) of a lead frame. The paragraph at Col. 2 lines 33-54 further describes the formation of the traces and it is respectfully submitted that a person of ordinary skill in the art would understand all of the described processes to involve the formation of traces that are substantially thinner than the leads (or other components) of a lead frame. The entire purpose of Lin was to provide a thinner package. (See, Col. 1, lines 10-15 of Lin). Since Lin's entire purpose was to reduce the thickness of the package, it is respectfully submitted that if it were obvious to substitute a lead frame that had a central opening for the traces described in the '362 patent in order to further reduce thickness, Mr. Lin would have done so. This is particularly true since Mr. Lin was certainly aware of lead frame designs having central openings. By way of example, another patent of Mr. Lin's that was from the same general timeframe describes a package that employs such a lead frame. See, e.g., U.S. Patent No. 5,329,159.[2] Accordingly, it is respectfully submitted that those of ordinary skill in the art would

[2] It is noted that Lin's U.S. Patent No. 5,329,159 is not believed to be of record in the present application. It was identified by the undersigned in a very quick search of patents issued to Mr. Lin that was performed to substantiate the undersigned's belief that Mr. Lin would certainly have been aware of lead frame designs having central openings (i.e.,

not be motivated to reduce the thickness of the package of Lin by substituting the lead frame of Ogawa for the thin film process described by Lin. Thus, it is respectfully submitted that the outstanding office action has not made a prima facie case of obviousness for at least this reason as well. Accordingly, it is respectfully submitted that the outstanding rejections of claims 1 and 4-15 based on the combination of Lin and Ogawa must be reversed for at least that reason as well.

4) Those or ordinary skill in the art would not be motivated to substitute a lead frame (which is relatively thick) for the thin film conductive layer disclosed by Lin to provide a thinner package.

As will be described in more detail below, the entire purpose of Ogawa is to permanently adhere a resin film 2 to the bottom surface of a lead frame in order to eliminate the need for a die attach pad. Thus, any reasonable combination of Lin and Ogawa would necessarily include the resin film 2. Thus, the proposed combination of Lin and Ogawa would not meet the language of any of independent claims 1, 7 or 15. Furthermore, the addition of Ogawa's resin film 2 would presumably defeat any gains that might be made by eliminating the metal traces that underlie the die in Lin. Accordingly, it is respectfully submitted that those of ordinary skill in the art would not be motivated to reduce the thickness of the package of Lin by substituting the lead frame of Ogawa for the thin film process described by Lin. Thus, it is respectfully submitted that the outstanding office action has not made a prima facie case of obviousness for at least this reason as well. Accordingly, it is respectfully submitted that the outstanding rejections of claims 1 and 4-15 based on the combination of Lin and Ogawa must be reversed for at least that reason as well.

D) The Rejection using Ogawa as the primary reference

The outstanding rejection also makes a reverse combination in which the Ogawa reference is used as the primary reference. Specifically, in the paragraph beginning at the bottom of Page 4 of the outstanding Final Office Action (dated June 29th, 2006), the Examiner takes the position that "it would have been obvious to one of ordinary skill in the art at the time the invention to provide the method of Ogawa with a plastic casing because the plastic casing would provide the process of Ogawa with a complete semiconductor package device. Although the Applicant does not contest that it would have been expected to provide Ogawa with a plastic casing, it is respectfully submitted that there is nothing in Ogawa standing alone, or in combination with Lin, that would remotely suggest the formation of a casing of the type recited in the claims on appeal.

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that did not include a die attach pad). Indeed, the '159 patent was just the second (and last) patent reviewed in that search.

Ogawa is directed at the fabrication of a lead frame having a support member (2, 8) that is secured to the bottom surface of the lead frame 1. The support member serves as a support for the die 4 both during assembly and **when the lead frame is eventually used in a package**. In the embodiment illustrated in Figs. 1 and 3, the support member is a resin film or plate 2 (e.g. polyimide). In the embodiment illustrated in Fig. 4, the support is a metal plate 8. In either event, as would be readily appreciated by anyone of ordinary skill in the art, the support member (resin film) **is intended to be integrated into the package**. This type of die support structure was well known at the time of Ogawa and such supporting structures were normally fully encased by the plastic molding material in the finalized package.

As currently presented independent claim 1 requires, inter alia:[3]

> mounting the lead frame and an integrated circuit die onto a strip of adhesive tape such that a lower surface of the die contacts the adhesive tape and the die is located in the central opening, and the lower surface of the lead frame also contacts the adhesive tape;
>
> * * *
>
> forming a plastic casing over an upper surface of the die and the upper surface of the lead frame wherein the plastic casing comes into contact with the adhesive tape **such that a lower surface of the plastic casing is substantially co-planar with the lower surfaces of the lead frame and the die**; and
>
> **removing the adhesive tape after forming the plastic casing to expose the lower surfaces of the die and the lead frame, whereby exposed portions of the lead frame form the only externally accessible I/O contacts for the package and plastic material fills at least portions of gaps between adjacent leads, such that the lower surface of the package is substantially co-planar and includes exposed portions of the plastic casing, the lead frame and the die.**

During prosecution, the Examiner has acknowledged that Ogawa does not disclose the step of forming a plastic casing over the die and lead frame in a manner that leaves the lower surface of the lead frame exposed and substantially coplanar with the lower surface of the plastic casing. The office action then relies on Lin for the propositions that it would be obvious to modify Ogawa to: (a) form a plastic casing over the lead frame in a manner that leaves the bottom surface of the lead frame exposed; and (b) remove the resin film 2 taught by Ogawa.

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[3] Independent Claims 7 and 15 require similar steps although the relevant wording of the claim varies somewhat.

It is respectfully submitted that those skilled in the art at the time of the present invention would **not** have been motivated by any reasonable combination of the Ogawa and Lin references to make the combination proposed by the outstanding rejection (or the specific combinations set forth in independent claims 1 and 7). As has been argued extensively during prosecution, the resin member 2 disclosed by Ogawa is very clearly intended to be a **permanent** structure and its removal would completely defeat the purpose of Ogawa reference. It is well settled that in order to support a prima facie case of obviousness, there must be some suggestion or motivation (either in the references themselves or in the knowledge generally available to one of ordinary skill in the art) to modify a reference or to combine the teaching of two (or more) references. See, MPEP §2143. It is also well established that if a proposed modification would render the prior art being modified unsatisfactory for its intended purpose, then, as a matter of law, there can **not** be a suggestion or motivation to make the proposed modification. MPEP §2143.01(v). In view of the fact that removing the resin member would completely defeat the purpose of Ogawa, it is respectfully submitted that nothing in Lin would motivate those skilled in the art to make the combination asserted in the outstanding rejection. Accordingly, it is respectfully submitted that a prima facie case of obviousness has not been made and that the outstanding rejections based on the use of Ogawa should be withdrawn for at least this reason.

In the outstanding final rejection the Examiner not address the fact that the resin film taught by Ogawa is permanently adhered to the bottom surface of the lead frame. However, Ogawa was extensively argued throughout the prosecution of the present reissue application. In an Advisory Action issued pursuant to an earlier final rejection (which was reversed after the first pre-appeal brief request for review – See the Advisory Action dated March 1, 2006), the Examiner appeared to acknowledge that Ogawa himself contemplated permanently adhering the resin film 2 to the bottom surface of the lead frame. However that Advisory Action stated that the rejection is not based on Ogawa's invention, but rather on Ogawa's characterization of the prior art. Specifically, the Advisory Action cites Col. 2. lines 20-21 of Ogawa which when describing the prior art states: "The adhesive force between the resin type adhesive agent and these metal material is not necessarily sufficient." The Advisory Action then appeared to jump to the conclusion that this passage suggests that the resin film 2 may be "peeled off in the next step beyond Ogawa." See Page 2 of the Advisory Action dated March 1, 2006. However, such step is clearly contrary to the teaching of Ogawa which even when discussing the prior art clearly contemplates that the resin film 2 would be a permanent structure. This can be clearly seen by reading the entire paragraph from which the above quote was taken out of context. Specifically, the paragraph that begins at Col. 2, line 15 of Ogawa reads:

> As mentioned above, the conventional lead frame is of such a construction that the resin film 2 is directly joined with the inner lead 1 made of a copper alloy or an iron alloy by means of the resin type adhesive 3. In general, however, the adhesive force between the resin type adhesive agent and these metal materials is not necessarily sufficient. On account of this, it is appreciated that, due to shear stress to be exerted at the time of bending work of the lead during the assembling step of the semiconductor package, or thermal stress to be applied under various heating environments, or else, adhesiveness at the above-mentioned adhesive interface becomes decreased to bring about very fine gaps between them. In such case, when moisture-adsorption takes place in the package, water is condensed in these small gaps, and this condensed water, when heated again, becomes vaporized to expand its volume to lead to a possible danger of bringing about cracks in the semiconductor package. Therefore, improvement in the adhesive force between the resin member and the metal member is of paramount importance **on the operational reliability of the semiconductor package**. (*emphasis added*).

It is submitted that this passage makes it clear that Ogawa contemplated that the resin member 2 was to be permanently attached to the lead frame and incorporated into the package in both his own invention and in the prior art to which he was referring. Accordingly, as previously expressed, it is respectfully submitted that removing the resin film would completely defeat the purpose of the Ogawa reference.

In view of the foregoing, it is respectfully submitted that no reasonable combination of Ogawa as modified by Lin would result in the formation of a package that has an exposed die that is substantially co-planar with the bottom surface of a lead frame and the bottom surface of the package as specifically required by each of the independent claims 1, 7 and 15 of the present application. Thus, it is respectfully submitted that the outstanding office action has not made a prima facie case of obviousness for at least this reason as well. Accordingly, it is respectfully submitted that the outstanding rejections of claims 1 and 4-15 based on the combination of Lin and Ogawa must be reversed for at least that reason as well.

E) The Flush Leads Feature of Claims 15, 11 and 12

It is respectfully submitted that claims 15, 11 and 12 are patentable for all of the reasons set forth above. Additionally, these claims specifically require that the lead frame be cut after the molding "such that each of the leads is substantially flush with an associated side surface of the casing." Such an arrangement is described at Col. 4, lines 32-37 of the present reissue application. The outstanding final office action points to Col. 4, lines 63-65 of Lin as meeting this limitation. (See, e.g. the second paragraph of page 6 of the outstanding final office action). The cited section of text is part of a discussion of Fig. 9. Specifically, it states that the traces can be severed along the

lines 54 to electrically disconnect the individual devices. As can be seen in Fig. 7, the "cutting lines" 54 are not shown as being flush with the side surface of the "resin body" 56 (which would correlate with the claimed casing). Therefore, Lin does not appear to teach or reasonably suggest an arrangement in which the traces are substantially flush with an associated side surface of the casing. Accordingly, it is respectfully submitted that the outstanding rejections of claims 11, 12 and 15 based on the combination of Lin and Ogawa must be reversed for this additional reason as well.

F) CONCLUSION

In view of the forgoing, it is respectfully submitted that the outstanding rejections of claims 1 and 4-15 should be withdrawn.

Respectfully Submitted,
BEYER WEAVER, LLP

Steve D Beyer
Reg. No. 31,234

VIII. CLAIMS APPENDIX

CLAIMS ON APPEAL

(Presented in Reissue Format)

1. A method for producing an electrical device comprising the steps of:

forming a flat lead frame including a plurality of leads extending radially from a central opening, the lead frame having opposing upper and lower surfaces;

mounting the lead frame and an integrated circuit die onto a strip of adhesive tape such that a lower surface of the die contacts the adhesive tape and the die is located in the central opening, and the lower surface of the lead frame also contacts the adhesive tape;

electrically connecting bond pads on a top surface of the die to associated lead frame leads using wire bonding with the adhesive tape in place such that the adhesive tape holds the die and lead frame in place during the wire bonding operation;

forming a plastic casing over an upper surface of the die and the upper surface of the lead frame wherein the plastic casing comes into contact with the adhesive tape such that a lower surface of the plastic casing is substantially co-planar with the lower surfaces of the lead frame and the die; and

removing the adhesive tape after forming the plastic casing to expose the lower surfaces of the die and the lead frame, whereby exposed surfaces of the lead frame directly form the only externally exposed and accessible I/O contacts for the package and plastic material fills at least portions of gaps between adjacent leads, such that the lower surface of the package is substantially co-planar and includes exposed portions of the plastic casing, the lead frame and the die.

2 -3. (Cancelled)

4. The method of claim 1, wherein the step of forming the lead frame comprises etching a metal sheet.

5. The method of claim 1, wherein the step of forming the lead frame comprises stamping a metal sheet.

6. The method of claim 1, wherein the step of forming the plastic casing comprises molding plastic onto the upper surfaces of the die and the lead frame.

7. A method of packaging an integrated circuit comprising:

providing a lead frame including a plurality of leads and a central opening, the lead frame having opposing upper and lower surfaces;

mounting the lead frame and an integrated circuit die onto a strip of adhesive tape such that a lower surface of the die contacts the adhesive tape and the die is located in the central opening, and the lower surface of the lead frame also contacts the adhesive tape such that the lower surface of the die and the lower surface of the lead frame are substantially co-planar;

electrically connecting bond pads on a top surface of the die to associated lead frame leads using wire bonding with the adhesive tape in place such that the adhesive tape holds the die and lead frame in place during the wire bonding operation;

molding a plastic casing over an upper surface of the die and the upper surface of the lead frame wherein the molded plastic casing comes into contact with the adhesive tape such that a lower surface of the plastic casing is substantially co-planar with the lower surfaces of the lead frame and the die; and

removing the adhesive tape after molding the plastic casing to expose the lower surfaces of the die and the leads, whereby exposed surfaces of the leads directly form the only externally exposed and accessible direct I/O contacts for a resulting integrated circuit package and plastic material fills at least portions of gaps formed between adjacent leads such that the lower surface of the package is substantially co-planar and includes exposed portions of the plastic casing, the lead frame and the die.

8. A method as recited in claim 7 further comprising mounting the package on a circuit board such that the lower surface of the die is in direct contact with a heat sink formed on the circuit board.

9. A method as recited in claim 7 further comprising applying solder to exposed portions of the leads.

10. A method as recited in claim 9 further comprising soldering the lower surfaces of the leads to a circuit board to electrically connect the package to the circuit board.

11. A method as recited in claim 1 further comprising trimming the leads such that peripheral portions of the leads are flush with side surfaces of the plastic casing.

12. A method as recited in claim 7 further comprising trimming the leads such that peripheral portions of the leads are flush with side surfaces of the plastic casing.

13. A method as recited in claim 1 further comprising applying solder to the exposed lower surfaces of the leads.

14. A method as recited in claim 7 further comprising applying solder to the exposed lower surfaces of the leads.

15. A method of packaging an integrated circuit comprising:

providing a lead frame including a plurality of leads and a central opening, the lead frame having opposing upper and lower surfaces;

mounting the lead frame and an integrated circuit die onto a strip of adhesive tape such that a lower surface of the die contacts the adhesive tape and the die is located in the central opening, and the lower surface of the lead frame also contacts the adhesive tape such that the lower surface of the die and the lower surface of the lead frame are substantially co-planar;

electrically connecting bond pads on a top surface of the die to associated lead frame leads using wire bonding with the adhesive tape in place such that the adhesive tape holds the die and lead frame in place during the wire bonding operation;

molding a plastic casing over an upper surface of the die and the upper surface of the lead frame wherein the molded plastic casing comes into contact with the adhesive tape such that a lower surface of the plastic casing is substantially co-planar with the lower surfaces of the lead frame and the die;

cutting at least the lead frame after the molding such that each of the leads is substantially flush with an associated side surface of the casing;

removing the adhesive tape after molding the plastic casing to expose the lower surfaces of the die and the leads, whereby exposed portions of the leads directly form the only externally accessible I/O contacts for a resulting integrated circuit package and plastic material fills at least portions of gaps formed between adjacent leads such that the lower surface of the package is substantially co-planar and includes exposed portions of the plastic casing, the lead frame and the die; and

applying solder to the exposed lower surfaces of the leads.

IX. EVIDENCE APPENDIX

NONE

X. RELATED PROCEEDINGS APPENDIX

NONE